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Areawide Stored Grain IPM

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Project Objectives

During the first year of this study, we characterized each of the storage facilities and pest management practices in the area-wide stored grain IPM project. In the second year of the project we will be focusing on trying to sample the same lot of grain multiple times for quality and insect density. We will also be focusing on aeration. Specifically, we want to do side-by-side comparisons of no aeration, manual aeration, and aeration with automatic controllers. We know that lowering grain temperature as soon as possible suppresses insect growth. We think the best way to do this is with automatic aeration controllers. We believe that aeration can be a very effective tool for insect control in elevators because grain temperature is so important in determining the rate of increase of insect populations.

True or False?

1) Indianmeal moth causes insect damaged kernels (IDK) in wheat.

2) Wheat and corn are graded infested if 2 or more insects are found per sample.

3) Lesser grain borers cause IDK in wheat.

Answers on the back

Methods

The Porta-Probe is a gasoline powered vacuum probe used to take grain samples at different depths in a grain bin. The motor stays on the ground and a 300 ft hose is attached to a cyclone at the top of the grain. Four foot aluminum probe sections are connected and pushed into the grain. Grain can be sampled up to 60 feet down. The grain samples can be used to estimate grain quality and insect numbers for different locations in a grain mass. The Porta-Probe is manufactured by Mill & Elevator Supply Co. Kansas City, MO.

Table 1: Bin X				
TC #	9/16/1998	10/1/1998	10/13/1998	10/26/1998
14	86	87	74	71
13	85	87	72	70
12	85	86	72	69
11	85	85	72	68
10	86	86	73	67
9	86	86	74	65
8	85	85	74	63
7	84	83	74	63
6	84	83	74	63
5	85	84	72	66
4	84	84	68	67
3	80	77	64	62
2	78	76	61	63
Cumulative Hours		10	72	154
Total Fan-Hours = 154		Fan HP = 25 (18.75 Kw)		
Total KwH = 2888		Cost at $0.065/KwH = $188		

Table 2: Bin Y (Y - Z Manifolded)						
TC #	10/19/98	11/16/98	11/23/98	11/30/98	12/8/98	1/4/99
14	**84**	57	53	54	57	63
12	**86**	70	66	67	68	68
10	**80**	78	**85**	**83**	76	75
8	75	**83**	79	75	73	73
6	74	69	62	76	65	50
4	74	76	72	76	65	63
2	76	60	71	61	65	42
Cumulative Hours		543		114 Hours		330 Hours
Bin Z - cooled 65 to 70 F				Bin Z - cooled 5 F		cooled 5F
Total Fan-hours = 987				Fan HP = 15 (11.25 Kw)		
Total KwH = 11,100				Cost at $0.065/KwH = $722		

What we learned

An example of effective aeration is shown in Table 1, where a 20-HP fan pushed air from the bottom of a large upright bin and a 5-HP fan extracted air at the top. In just one month, two temperature fronts were moved through this grain, cooling it from about 84°F to about 65°F. Insects stop developing and eventually die at this temperature. The purple area in the table indicates where the grain was warm through late September and early October. The second front (light blue) was moved almost all the way out of the grain by the end of October. Here insects will be easily controlled, and the cost of aeration was only $188 (0.4 cents-per-bushel).

Table 2 shows a less effective aeration. Two upright bins were aerated by a single 15-HP fan motor. Between mid-October and early January, over $700 was spent on electricity (0.9 cents-per-bushel), but the warm area near the middle of bin Y was never really removed, and almost no cooling was done in bin Z. Insects may have developed easily in the warm grain, and may be the reason why the grain near thermocouples 8 and 10 remains 20 - 30°F warmer than other grain in the bin.

Plans for the Future

In the future we will work with you to hook up automatic aeration controllers to some of the aeration fans. The controllers should cool the grain more efficiently than manual aeration because the fans will only come on when the air temperature is below a set threshold temperature. Normally we use three temperature thresholds during a season: 75°F, 65°F, and 45°F. The next lower threshold temperature is selected on the controller after the hour meter indicates the fan has run long enough for a cooling front to pass through the grain. Aeration controllers allow the grain to be cooled sooner and with less fan run time. Which means lower electrical costs and grain shrinkage for you!

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Answers to questions: 1) false: indianmeal moth does not cause IDK; 2) false: wheat: 2 or more insect injurious to grain; corn: 2 or more weevils, or 1 weevil + 5 injurious insects, or 10 injurious insects; 3) true: the lesser grain borer is one of the primary causes of IDK.